Chapter 37 – Indoor Air Quality (REDACTED)

37.1 Introduction

37.1.1 Purpose

This chapter provides guidance for the evaluation of indoor air quality (IAQ) concerns and guidance for their control when necessary.

37.1.2 Applicability

This manual is applicable to: (1) all Ames Employees; and (2) all persons and entities who agree in writing to comply with this manual.

37.2 Responsibilities for IAQ Concerns

37.2.1 Center Director

REDACTED

37.2.2 Safety, Health and Medical Services Division (Code QH)

37.2.2.1 Safety Division

1. Investigate employee concerns about IAQ to determine if a recognized health hazard exists.
2. Refer employees with health complaints to the Ames Health Unit for medical evaluation using the Form in Appendix B.
3. Provide qualified staff to conduct Indoor Air Quality investigations.
4. Follow the steps listed in Appendix A. ARC procedures for IAQ Investigations to conduct the IAQ investigations. Phase III and IV should be conducted after the medical evaluation.
5. Recommend actions to alleviate IAQ concerns.
6. Keep records in accordance with OSHA and NASA requirements.

37.2.2.2 Ames Health Unit

1. Evaluate the medical condition of employees who are potentially affected by exposure to indoor contaminants.
2. Refer employees with a non-occupational illness to their personal physician for treatment.
3. Provide medical treatment or referral to a specialist for an occupational illness.
4. Request an Industrial Hygiene assessment of a possible work place exposure when there is a suspected occupational illness.
5. Provide a medical opinion about health risks associated with current evaluated building conditions and communicate health information to individuals or groups of employees.
6. Keep records in accordance with OSHA and NASA requirements.

37.2.3 Supervisors

REDACTED

37.2.4 Plant Engineering Branch (Code JFP)

REDACTED

37.2.5 Facilities Engineering Branch (Code FEF)

REDACTED

37.2.6 Facilities Service Managers (FSMs)

REDACTED

37.2.7 Employees/Occupants

1. Notify their supervisor of any IAQ concern or illness that you suspect is possibly related to IAQ.
2. Report to the Ames Health Unit for a medical evaluation if they are requested to do so by their Supervisor or the Safety Division.
3. Implement all corrective actions recommended by the Safety Division for occupants.
4. Do not use any chemicals or pest controls that are not approved by your supervisor.
5. Implement all applicable corrective actions recommended by Safety Division.
6. Do not block air vents or grilles and do not add filters to air supplies.
7. Comply with the ARC smoking policy (Chapter 5 of the Ames Health & Safety Manual).
8. Dispose of garbage promptly and properly.
9. Store food properly.
10. Avoid bringing products into the building that could release harmful or bothersome odors or contaminants.

37.3 IAQ Investigation and Hazard Assessment

37.3.1 Investigation Process

The Safety Health and Medical Services Division will determine the appropriate strategy for individual IAQ evaluations as well as the application of publishing regulations and guidelines. The process and checklists in Appendix A will be used for IAQ investigations.

37.3.2 Hazard Evaluation

The evaluation of the degree of hazard associated with an indoor air quality concern will be based on comparison of existing conditions with applicable OSHA standards for worker exposure to chemicals. Factors that adversely affect the comfort of occupants, such as inadequate air flow, temperature extremes, or poor lighting will be reported to the responsible supervisor to determine appropriate action, in the absence of any recognized hazard. Whenever visible mold is detected in indoor environments, mitigation actions will be recommended, without regard to species identification. Interpretation of regulations and guidelines for chemical and biological exposures must be made or supervised by a Certified Industrial Hygienist.

37.4 References

1. U.S. Environmental Protection Agency (EPA)/National Institute for Occupational Safety and Health (NIOSH). Building Air Quality-A Guide for Building Owners and Facility Managers. DHHS (NIOSH) Pub 91-114, Washington, DC, GPO, 1991. http://www.epa.gov/iaq/largeblgs/bagtoc.html
2. U.S. EPA. An Office Building Occupant's Guide to Indoor Air Quality. Washington DC, GPO, 1998. http://www.epa.gov/iaq/pubs.occupgd.html

3. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) and American National Standards Institute (ANSI). Acceptable Ventilation for Indoor Air Quality. ASHRAE 62-1999, Atlanta, GA, 2001.
4. ASHRAE. Thermal Environmental Conditions for Human Occupancy. ANSI/ASHRAE Standard 55-1992, Atlanta, GA, 1992.
5. Occupational Safety and Health Administration (OSHA). Indoor Air Quality Investigation. Technical Manual, Section II, Chapter 2, OSHA Instruction TED 1.15, Washington DC, DOL, 1995. http://www.osha.gov/dts/osta/otm/otm_iii/otm_iii2.html
6. American Conference of Governmental Industrial Hygienists (ACGIH), Guidelines for the Assessment of Bioaerosols in the Indoor Environment. Cincinnati, OH, ACGIH. 1989.
7. ACGIH. Industrial Ventilation-A Manual of Recommended Practice. 23rd Ed., Lansing, MI, 1998.
8. OSHA. A Brief Guide to Mold in the Workplace. Washington DC, DOL, 2003. http://www.osha.gov/dts/shib/shib101003.html

37.5 Appendices

37.5.1 Appendix A: ARC Procedure for IAQ Investigation

Building: _____ **Area/Room:** _____ **Code:** _____ **Group:** _____ **Date:** _____

Supervisor of Area: _____ **Ext:** _____ **Investigator:** _____

Contacts: _____

IAQ Concern: _____

Phase I. Characterize Employee IAQ Concern & Begin Screening Investigation (See Checklists #1, #2, #3, #4, and Summary Checklist as guides)	**Comments**	**Done**	**N/A**
1. Identify and document location and type of concern (e.g., temperature, humidity, odors, moisture, symptoms, etc.).			
2. Interview concerned employee(s) and other employees near area, if applicable.			
3. Walk through area of concern, visually inspect, and document findings.			
4. Examine outdoor air intakes and verify the absence of pollutants.			
5. If cause of IAQ problem is apparent, notify appropriate party for corrective action.[2]			
6. If the problem appears to be health symptom-related, refer concerned employee(s) to the Health Unit; use the "Ames Medical Referral Form for Employee Concerns" in Appendix B.			
7. If IAQ concerns cannot be addressed proceed to Phase II.[3]			

Phase II. Evaluate Building Performance (See Checklist #3 and Summary Checklist as guides)	**Comments**	**Done**	**N/A**
1. Check air pressure and air movement in complaint areas.			
2. Measure CO2, temperature and humidity.			
3. Inspect mechanical systems relevant to building.			
4. Note and compare any odors in all areas of building.			
5. Look for signs of water leakage or moisture.			
6. Inspect carefully for mold or any microbial growth.			
7. Examine the building hazardous materials inventory and inspect the storage, waste, and process areas, if any.			
8. Follow-up on Medical Referral(s) and consider the Ames Health Unit's conclusions on employees' medical status and possible IAQ connections. Discuss finding.			
9. Contact Facilities Maintenance (Code J) for maintenance records and HVAC investigation. Complete IAQ Checklist #3.[1]			
10. If problem is identified at this stage, necessary mitigation actions can be taken immediately. If not, proceed to Phase III. [3]			

Phase III. Performed if Phase I & II Investigations are Inconclusive	**Comments**	**Done**	**N/A**
1. Meet with Facilities Maintenance and verify that all systems are in good operating condition and all inspections of equipment have been completed. Determine if ventilation system meets the building needs and if any pattern exists between HVAC and IAQ concerns.			
2. Investigate potential sources from identified pathways, if any (use smoke tubes to identify air flow).			
3. Meet with the Occupational Health Physician			
4. Address possibility of ergonomic issues (lighting, glare, workstation layout, repetitive motion, poor body positions, improper tools, etc.).			
5. If a cause is identified for the IAQ problem, address and correct as soon as possible. If mitigation will be lengthy develop a plan and timeline; communicate this information to concerned employees and their management.			
6. If an IAQ problem is not indicated and no cause is found, consider other causes such as individual sensitivities, unrelated illness mimicking an IAQ illness, water/foodborne illness, psychosocial or job stressors, and general discomfort .			

Phase IV. Performed if Phase I & II, and III Investigations are Inconclusive	Comments	Done	N/A
1. Further selective testing may be necessary such as measuring suspected contaminants. Sampling should also compare outdoor and indoor ambient levels of pollutants. May require air, bulk, and/or wipe samples, depending on the suspected contaminant. Sampling may include microbial, chemical, or particulates (fibers, hazardous dust, or unusual dust).			
2 [3]Explore possible hypothesis for IAQ cause and effects after reviewing inspections, symptoms, and interviews. Consider all investigations, interviews, records, and sampling data. Use a multi-disciplinary team approach with expertise in medicine, industrial hygiene, microbiology, ventilation and building maintenance. Also include representatives from management, the building, and the employees.			

[1] See also the HVAC investigation form from CDC/NIOSH as a resource.

[2] See list of Ames Contacts for IAQ Investigation and Mitigation at end of Appendix.

[3] IAQ status must be periodically communicated to the concerned employees and their management. The recommendation, at a minimum, is at least every few weeks and at the end of each phase of investigation.

Ames IAQ Checklist #1 – Employee(s) Concerns

Characterize Employee(s) IAQ Concern & Establish Who is Affected	Comment/Answer
1. How many people occupy the building?	
2. Is the distribution of people the same throughout the building, or are there zones of high and low occupancy?	
3. How many people and what percentage of those asked have complaints about the IAQ?	
4. Can concerned employees be categorized by job activities, location, organization, time, or season, etc.?	
5. How consistent are the reported symptoms or complaints?	
6. Do the symptoms continue when the employees are at home? Over weekends? During holidays or vacations?	
7. Do the affected employees notice symptoms whenever they are in the building or do their symptoms occur at a specific time or in association with a specific activity in or near the building?	
8. When did the problem begin? What was going on then that might have caused or contributed to the IAQ problem?	
9. Has anyone been seen by a physician? What was the physician's diagnosis and treatment?	
10. Are absence and sick leave records available for review?	
11. Have there been more absences for specific illnesses recently compared to other months or the same season in other years?	
12. Are there any predisposing factors such as allergies, hobbies, recreational activities, illness, or medications?	
13. Did the occupants recently move into the problem building? Were there any previous IAQ concerns in the former location?	
14. Has there been any change in management or the organization?	
15. What kind of symptoms and health effects are described by concerned employee(s)?	
16. Is there an appropriate control group nearby for comparison? How many employees in the control group have the same complaints as the people in the building of concern?	

Building: _____ Area/Room: _____ Code: _____ Date: _____

Supervisor: _____ Ext: _____ Investigator: _____

Ames IAQ Checklist #2 – Building/Environment Characterization

Characterization of Building and Environment	Comment/Answer
1. What type of building is involved, e.g., office, shops, labs, mixtures?	
2. How large is the building (e.g., number of floors, rooms, square footage, ceiling height, etc.)?	
3. How old is the building?	
4. Has there been any recent renovation or reconstruction?	
5. Describe the type of activities or operations in the building?	
6. Are there any indoor sources of contamination (e.g., solvents, wet processes, cleaning operations, machining, painting, adhesives, etc.)?	
7. Is any equipment operated continuously or intermittent?	
8. Are IAQ concerns isolated to only a part or section of the building?	
9. Are the occupants satisfied with the general cleaning and maintenance of the building?	
10. Are there any smoking issues concerning the building?	
11. Is there any new carpeting, furniture, or paint/wall covering?	
12. Are there kitchens, food storage, or garbage within the building?	
13. Are any hazardous materials or hazardous waste stored in building?	
14. Are there any odors?	
15. Is there evidence of water damage/leakage/moisture/ microbial growth?	
16. Is there evidence of heavy dust on surfaces?	
17. Is there evidence of insects, pests, or rodents? Any use of pesticides?	
18. Are there potted plants with possible mold/bacterial growth?	
19. Are there complaints of thermal discomfort?	
20. Are any restroom drain traps dry or emitting odors?	

Building: _____ Area/Room: _____ Code: _____ Date: _____

Supervisor: _____ Ext: _____ Investigator: _____

Ames IAQ Checklist #3 – Ventilation System

Examination of Ventilation System	Comment/Answer
1. How is air supplied to and distributed throughout the building?	
2. How many HVAC units are there? Are the problems confined to zones serviced only by some of these units?	
3. Do the windows open?	
4. What type of heating and cooling is used?	
5. Is the air humidified or dehumidified? If so, how?	
6. How much outdoor air is brought into the building (volumetric flow rate per person or per square foot of floor area)?	
7. Does the fresh air supply meet the building's designed rates and the ASHRAE recommendations?	
8. Where are the outdoor air intakes? Are there any sources of pollution nearby? (e.g., loading dock, vehicles, repair/ construction, cooling towers, tanks, debris, sewage, pesticides, allergens from trees/plants, exhausts, stacks, plumbing vents.) Are dampers working properly?	
9. Is the air filtered? How often are the filters changed? Are filters in good condition with no leakage at edges?	
10. Do building occupants complain that the air is too hot or cold, or too damp or dry?	
11. Does the ventilation system operate whenever people are in the building?	
12. Are pollution sources in the building adequately ventilated?	
13. Are negative and positive pressures adequate for building use?	
14. Is there any standing water in drains, condensate pans, or any other area?	
15. Are ducts in good, dry condition with minimal soot or debris?	
16. Are maintenance records for the ventilation systems of the building available for review? Is maintenance carried out to a prescribed schedule? (e.g., cleaning, lubrication, settings, inspections for: dampers, motors, belts, fans, coils, filters, bearings, heaters, chillers, etc.). All equipment should be intact, dry, reasonably clean, and running smoothly.	
17. Are supply air diffusers and return air grilles clean and working?	

Building: _____ Area/Room: _____ Code: _____ Date: _____

Supervisor: _____ Ext: _____ Investigator: _____

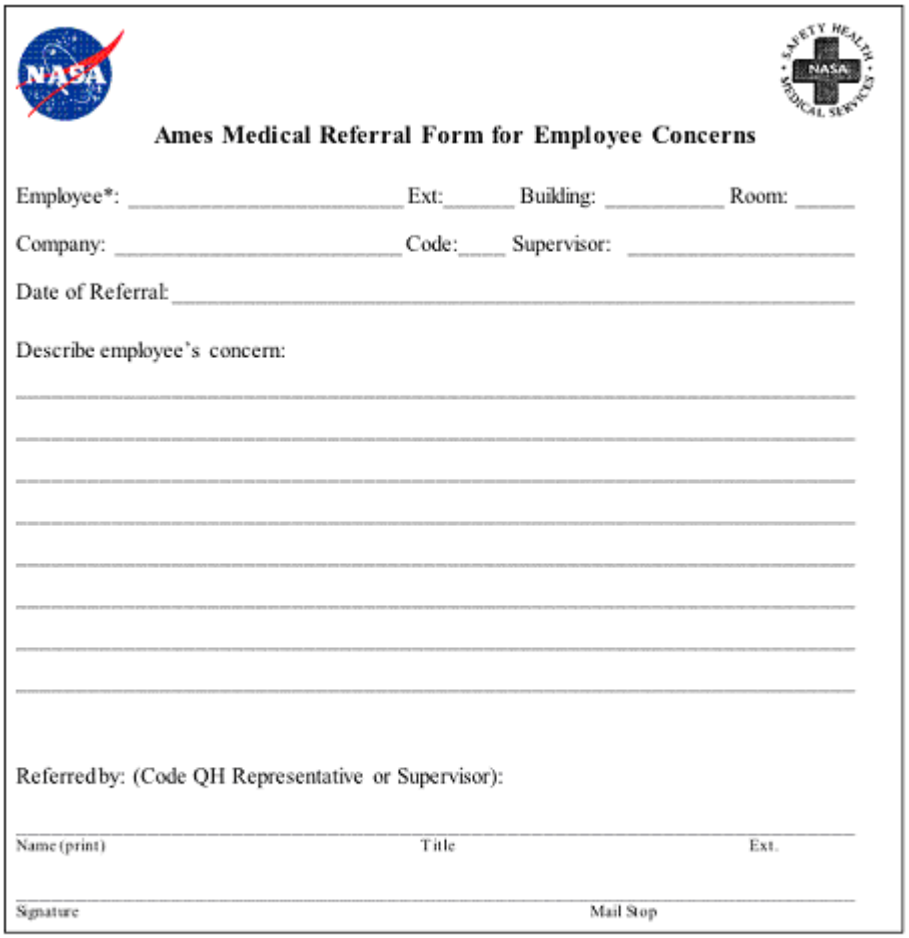
Ames IAQ Checklist Summary

A. Visual Inspection of Area (check yes if present)*	Yes	No	B. Building Air Intake Inspection (check yes if present)*	Yes	No	C. HVAC Inspection (check yes if properly maintained)**	Yes	No
1. Upholstered furniture			1. Near loading dock			1. Air filters (last replaced? _____)		
2. Carpet			2. Near passing or parked vehicles			2. Fan belts		
3. New paint/adhesives			3. Near parking lot or roads			3. damper settings: % fresh air _____		
4. Kitchen			4. Near construction			4. Fan motor/blades clean		
5. Food storage			5. Near repair work			5. Heating coils clean		
6. Garbage			6. Near maintenance work			6. Condensate drain clean		
7. Restroom drain traps (dry)			7. Bird screen obstruction			7. Condensate pan clean		
8. Potted plants			8. Near dumpster			8. Condenser coil clean		
9. Cleaners/janitorial			9. Near debris			9. Negative/positive pressures ok		
10. Whiteboard cleaners/pens			10. Near sewage					
11. Cosmetics/perfumes			11. Near leaking tank					
12. Equipment/machines			12. Recent pesticide/ herbicide application					
13. Hazardous materials			13. Near allergen/ pollens/plants/trees					
14. Hazardous waste			14. Near other sources of pollution					
15. Gas cylinders			15. Cooling tower 25' from intake			**D. HVAC Maintenance**		
16. Poor housekeeping						1. Chillers		
17. Heavy dust on surfaces						2. Boilers		
18. Odors						3. Ducting (lined? condition?)		
19. Water damage/ leaking/moisture						4. Bearings lubricated		
20. Mold/microbial growth						5. Air filters		
21. Insects, pests/ rodents						6. Heating coils		
22. Print/copy rooms						7. Condenser coils		
23. Shops/labs								
24. Thermal discomfort								
25. Noise			* If yes, describe possible contributory factor to IAQ concern			** If no, describe deficiency and schedule		

Ames Contacts for IAQ Investigation and Mitigation

Ames Health Unit	**Ames Trouble REDACTED for the following:**	**Call your Code QH Health & Safety Representatives for the following:**
REDACTED Code QH Civil Servants and their numbers are listed at: _REDACTED Ames Code QH Industrial Hygiene Building REDACTED Ames Code QH Occupational Safety REDACTED PAI Health & Safety Office for Code QH REDACTED Safety Hotline REDACTED	• Water leakage • Janitorial services • Facilities maintenance • HVAC maintenance • Cooling towers **To Report a Hazard:** REDACTED Or, if it is a hazard that presents an immediate and dangerous situation, call 911 from an ARC phone.	• Hazardous materials concerns • IAQ issues • Mold concerns Ca **REDACTED** identify your Health & Safety Representative or check on-line at:

37.5.2 Appendix B: Medical Referral Form



Ames Medical Referral Form for Employee Concerns

Employee*: _____ Ext:_____ Building: _____ Room: _____

Company: _____ Code:____ Supervisor: _____

Date of Referral: _____

Describe employee's concern:

_____

_____

_____

_____

_____

_____

_____

_____

Referred by: (Code QH Representative or Supervisor):

_____

Name (print) Title Ext.

_____

Signature Mail Stop

*Includes Civil Servants and on-site contractors

Please make copies of this completed form and **give original to employee** to take to the Ames Health Unit REDACTED Distribute copies to:

Employee's Supervisor ❑ Safety Office (REDACTED) ❑ Ames Health Unit (REDACTED) ❑

END OF DOCUMENT